F·A·A·M facility for airborne atmospheric measurements

FLIGHT FOLDER

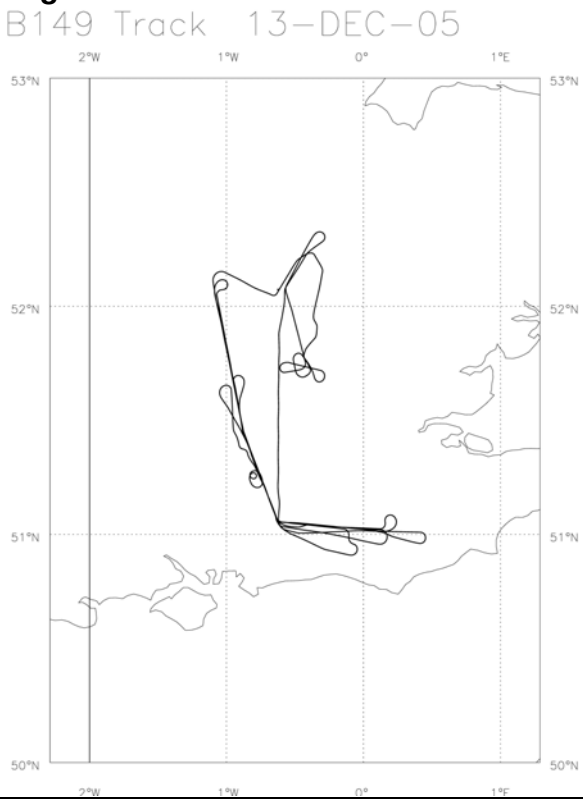
Flight No.:	B149
Date:	13 Dec 2005
Take Off	11:59:13
Landing:	16:10:13
Flight Time	4h11m00

Campaign: Buncefield Smoke Experiment

Operating Area: South East England around Hemel Hemstead

POB	Position	Name	Institute
1	Captain	Alan Roberts	Directflight
2	Co-pilot	Graham Morgan	Directflight
3	CCM	Jackie Mulholland	Directflight
4	Mission Scientist	Clare Lee	Met Office
5	Flight Manger	Alan Woolley	FAAM
6	Core Chemistry	Ruth Purvis	FAAM
7	Cloud Physics / CCM2	Paul James	FAAM
8	Mission Scientist 2	Stuart Newman	Met Office
9	Filters / PSAP	Stuart Heath	FAAM
10	SWS	Dave Kindred	Met Office
11	AMS	James Allen	Manchester University
12	CPI	Hazel Jones	Manchester University
13	CCM training	Joanne Green	Directflight
14			
15			
16			
17			
18			
19			

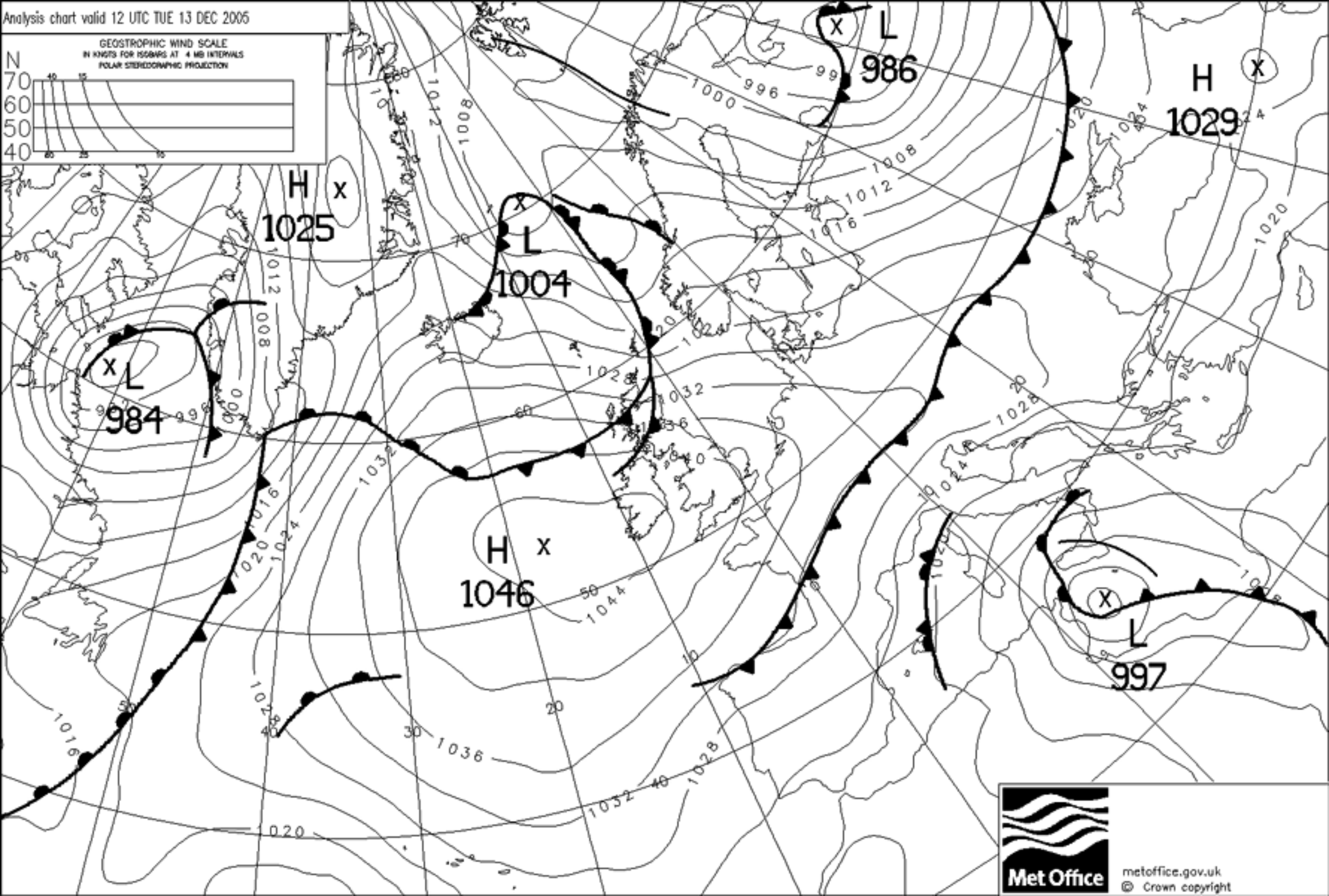
Flight Track:



FLIGHT SUMMARY

Flight No b149
Date: 13 Dec 2005
Project: Buncefield Smoke Experiment
Location: Central England

Start Time	End Time	Event	Height (s)	Hdg	Comments
114445		engine start	-.39 kft	125	
114612		inu to nav	-.39 kft	125	
114842		taxy start	-.39 kft	099	
114850		camera recording	-.39 kft	062	
115913		T/O	-.39 kft	213	
120444		asp open	9.0 kft	231	
120839	122925	Run 1	9.0 kft	167	
122155		Run 1	9.0 kft	090	C
122322		jw nevz zero	9.0 kft	087	
123107		qnh	7.1 kft	119	1039
123240	130402	Run 2	5.3 kft	272	
124030		Run 2	5.3 kft	295	C
124212		Run 2	5.3 kft	341	plume top
124452		Run 2	5.3 kft	328	interrupt for orbit
124905		Run 2	5.3 kft	351	resume
125318		Run 2	5.3 kft	345	B
130729	132826	Run 3	4.3 kft	172	5000 ft
131254		qnh	4.3 kft	167	1040
131705		Run 3	4.3 kft	153	B
132308		Run 3	4.3 kft	154	top of plume
132534		Run 3	4.3 kft	089	C at last entry
132847		psap interrupted	4.3 kft	119	
133125	134907	Run 4	3.3 kft	284	
133631		Run 4	3.3 kft	304	Point C
134534		Run 4	3.3 kft	352	B
135132	141244	Run 5	2.3 kft	200	starts at b
140121		Run 5	2.3 kft	153	C
140956		Run 5	2.3 kft	087	D
141702	143552	Run 6	1.3 - 1.4 kft	297	
143227		Run 6	1.3 kft	320	
143950	145628	Run 7	3.3 kft	142	
144303		Run 7	3.3 kft	153	B
144422		Run 7	3.3 kft	156	psap off
144453		Run 7	3.3 kft	157	psap on
144837		Run 7	3.3 kft	153	C
144849		Run 7	3.3 kft	125	plume
145626		Run 7	3.3 kft	089	
145822	151325	Run 8	3.8 kft	284	
150544		Run 8	3.8 kft	285	C
151810	152410	Run 8	3.9 kft	359	resumed
153634	153858	Run 9	3.4 kft	162	
153930	154132	Run 10	2.9 kft	166	
154210	154342	Run 11	2.4 kft	266	
154348	154640	Run 12	2.4 - 1.9 kft	041	
154815	155051	Run 13	1.4 kft	309	
155347	155517	Run 14	1.4 kft	049	
161013		Land	-.32 kft	214	


Analysis chart valid 12 UTC TUE 13 DEC 2005
GEOSTROPHIC WIND SCALE
IN KNOTS FOR ISOBARS AT 4 MB INTERVALS
POLAR STEREOGRAPHIC PROJECTION
N
70
60
50
40
40
15
60
25
10
H
1025
L
1004
L
984
H
1046
L
986
H
1029
L
997
Met Office
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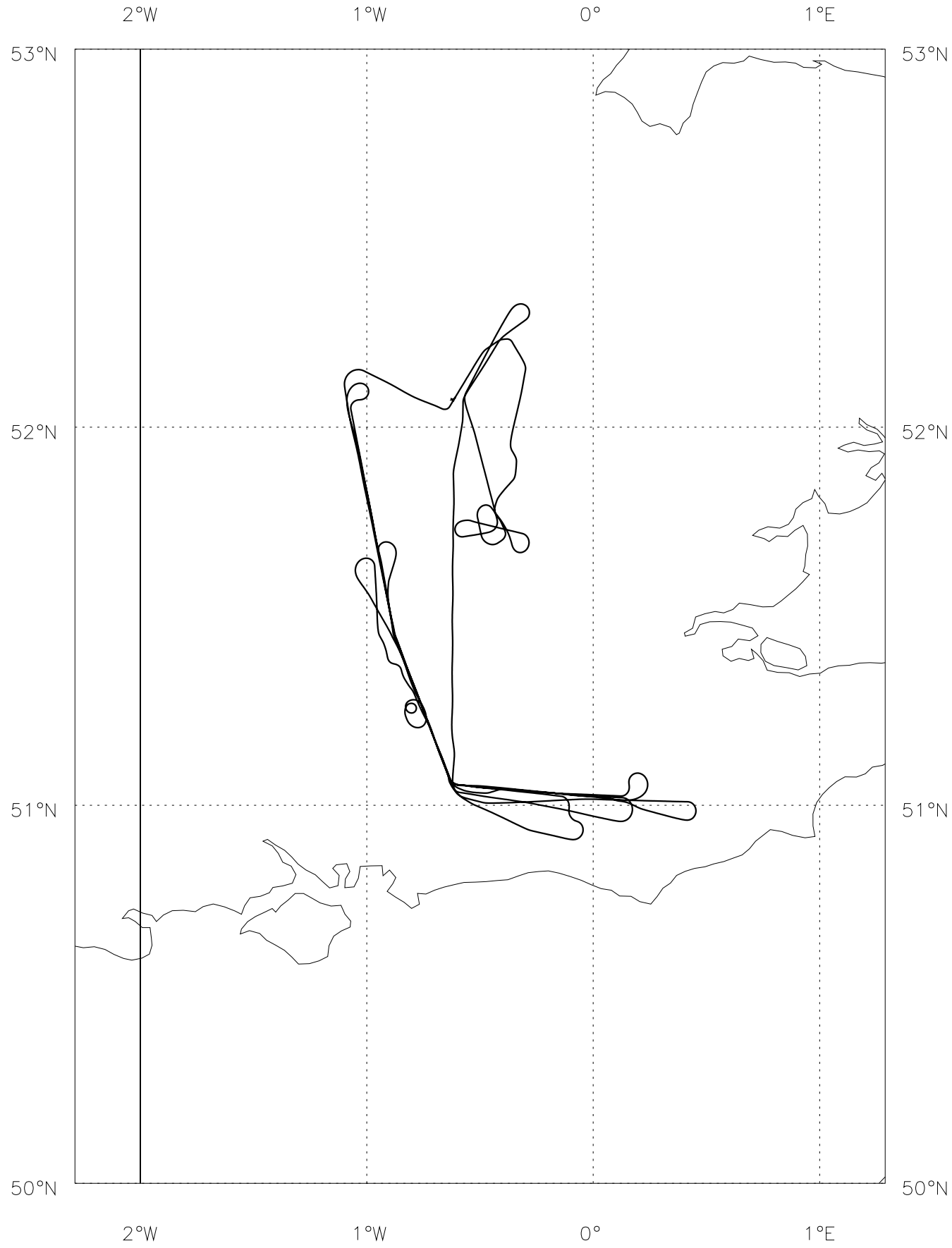
B149 Track 13-DEC-05



Fire Smoke

B149 – 13th December 2005

Flight path way points:

A. Daventry Beacon 52 10N 01 10 W
B. Woodley Beacon 51 25N 00 50 W
C. Midhurst Beacon 51 05N 00 40 W
D. Mayfield Beacon 51 00N 00 05E

1200	Transit to Daventry Beacon	30
1230	Straight and level from A to D at 9000 ft	30
1300	Return straight and level from D to A at 8000 ft	30
1330	Straight and level from A to D at 7000 ft	30
1400	Return straight and level from D to A at 6000 ft	30
1430	Straight and level from A to D at 5000 ft	30
1500	Return straight and level from D to A at 4000 ft	30
1530	Straight and level from A to D at 3000 ft	30
1600	Return straight and level from D to A at 2000 ft	30
1630	Transit to Cranfield	30
1700	Land at Cranfield	30

Mission Scientist debrief

B149 – 13th December 2005
Fire Smoke Sortie
Mission Scientist – Clare Lee

This was the second flight to study the smoke from the Buncefield fuel depot fire at Hemel Hempstead. A four point leg (Daventry Beacon – Woodley Beacon – Midhurst Beacon – Mayfield Beacon) was set up such that we could operate in the congested airways in the SE. Initially we were given priority E clearance which is slightly higher than general aviation, but due to the congestion there were occasions when air traffic had to deviate us from the flight track and the pilots had to make evasive maneuvers. Scientifically this area of operation should only be considered in exceptional circumstances. Towards the end of the flight, higher priorities were given such that we could operate right over the source of the fire.

After take off the smoke plume over the source could be seen clearly, which was been capped by an inversion. Generally there was 7/8 to 8/8 Cu below clearing to the North and 2/8 to 3/8 of thin Ci above. A run at 9000ft was made to determine a visual location of the plume. The plume was a narrow strip extending away from the source crossing the flight track at the Midhurst Beacon turning point. At the end of the run a procedural turn and descent (non-profile) was made. A reciprocal run from Mayfield towards Daventry beacon was made at 6000ft, still above the Cu cloud tops. The local pressure setting was 1039mb. Just after Midhurst turning point the aircraft was visually over the plume. The cloud physics and core chemistry instruments did not record any significant changes. The end of the run was terminated early to optimize the time at the plume area. A non-profile descent to 5000ft was made and reciprocal run towards Mayfield. The Cu tops were approximately 300ft below. At 5000ft the very narrow top of the plume was measured by PCSAP and the CO concentrations at 13:22 at Midhurst beacon increased. This run was also terminated early for a descent and turn to 4000ft. A marked inversion was seen by core chemistry during the descent. A reciprocal leg at 4000ft in the Cu tops was made towards Daventry. Just before Midhurst at 13:36 with Cu tops 50ft below, the aircraft entered the plume for approx 2 minutes, showing an increase in CO and PCASP concentrations. This run was also ended early. A turn and descent to 3000ft was made, with both core chemistry and AMS noting boundary layer conditions. At 3000ft a run was made in the bottoms of the Cu towards Mayfield. The bottom of the plume was measured at 14:01 just SE of Midhurst. At 1403, due South of Hemel Hempstead, a greater increase in CO and PCASP were seen. The run was extended East past Mayfield to determine the horizontal extent. At the end of the run a turn and descent to 2000ft was made, followed by a run back to Daventry. At 14:26 the plume was visually seen above and small rise in CO and PCASP was noted. There was a particularly large amount of air traffic at 2000ft. A staggered ascent to 4000ft was made and reciprocal run to Mayfield was made. At Mayfield only residual increases were seen. The main plume had moved further East to 51.0N, 0.2W measured at 14:50. A reciprocal leg to Midhurst was made at 4500ft above the Cu tops. No increase in CO or PSCAP was seen. At Midhurst a new heading direct to Cranfield was made at 4500ft to pass close to Hemel Hempstead. At 15:35 the aircraft priority was changed to enable flights over the source. At 15:45 a perpendicular pass through the plume close to the source at 2500ft was made, with PCASP, CO and AMS observing increased readings. At 15:48

a run along in the plume at 2000ft towards the source was made. At 1553 a second run was made along the plume at 2000ft. During this run the largest readings were observed with PSAP, AMS, CO and the CPI observed soot approximately 10 - 50 micron in diameter.
The aircraft was then recovered to Cranfield.

Instrument status
Cloud physics – OK
PSAP – OK
Core chemistry – OK
SWS – OK
CPI – OK
AMS – OK
Filters – OK
Note the standard filters and those from AMS was police escorted to government labs for analysis.
ARIES – OK (on for training with covers on)

Aircraft Scientist's Log

Flight No B.~~149~~.... Date ...13/12/05 Page 1 of 12

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GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
12:00					Take Off Cranfield.
12:05					Can see plume at ~10 o'clock.
					Extending ahead.
					V. limited in vertical extent
	~~R1~~				few kft. only.
120839	R1	9000ft.	166	51.7/0.9.	Run start.
					Running nearly parallel but slow
					interception with downwind.
					wind 11ms⁻¹ 127°.
					~~Plume~~ from eye. estimating
					plume top at 6kft.
122137		9000ft.	087	51.0/0.5W.	at point C.
					plume appears to be narrow.
					Have gone over top of it.
					winds 12ms⁻¹ 147°
					O3 50.85, CO 116.5
122925	Rlead.	9000ft.		51.0/0.1E	ending run.
					descending to 6000ft.
					not profile descent as
					turning whilst descending.
					7/8+ Ci below, 2/8 Ci above.
					press. setting 1039 mb.
123260	R2	6000ft.			run from D to A.
					20 → 120 cants. increase in
					aerosol.

Aircraft Scientist's Log

Flight No B 149 Date 13/12/05 Page 2 of 17

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GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
12 3540				51.0/0.1	Above 4 tops. (8/8)
					wind OD 27 knots aircraft.
					wind 13 ms^{-1} 22°.
					Can see plane ahead.
					from 10 o'clock to 3 o'clock.
					03 50.4, CO 121.31
					all ambient. SO2. 0.58
123856.					Can see plume strip ahead.
124022		6000ft.		51.0/0.6	At point C. turning.
					wind 17 ms^{-1} /26°
124120				51.0/0.6.	Over plume.
					545 PCASP steady.
					no changes in dem. or AMS
124210				51.1/0.6W	Over top.
					winds 13 ms^{-1} /15°
					T 1.66, T_D -20.9°
124306				51.1/0.7W	At other edge
					8/8 4 below, plume looks
					like v. dark grey patch.
					cloud.
124452.	R2 int.				Intercepting run - left turn
					due to air traffic. ~45° bank angle.
124905	R2	6000ft.		51.2/0.7	Recommencing run
124957					~~Cloud~~ cloud 1/8 4.
					below, 3/8 Ci above.

Aircraft Scientist's Log

Flight No B.149 Date 13/12/05 Page 3 of 12

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GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
125317		6000ft.	351°		At point 6.
					220knts aircraft speed.
					wind 11ms⁻¹ 16°
					aircraft wind 24knts 134|°
125524				51.5N/0.9W	going over 7/8 W below.
130402	Red.	6000ft		52.0N/1.0W	Stagging on 10 miles short to optimise time around plume.
					Turning left + descending
					to 5000ft.
130729	R3	5000ft.	169	52.0/1.0W	37miles from Wradley
					wind 13ms⁻¹ /352°.
					CO doing cal at end of runs.
					wind: 12ms⁻¹ /353°
					010° /21knts
131214		5000ft.	167	51.6N/0.9W	Over 7/8 W. by ~300ft.
					RPSP decreased from
					100 → 20 units
					AMS seeing trace amount
					of sulphate ~ ½ µm
					normal for free trop.
					O3 46.7 → 40 110 ppb
					c v. slight decrease
					Can see plume to right from
					12 o'clock to 8 o'clock ↻ ℄
131612					Clear below.

Aircraft Scientist's Log

Flight No B.149..... Date 13/12/05..... Page 4 of 12

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GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
131044		5000ft.	154		turn at point B
					appears that source is
					no longer emitting smoke.
					Can see plume ahead.
					in tops of Cu.
132054					Over 8/8 Cu., 4/8 Ci above
					definite plume
132200					midpoint way point (C) in
					middle of plume!
132325					PCASP 5000 cc. } sudden
					CO 140 mb peak. } peak.
132606					PCASP 40 cc
					v. narrow plume.
					AMS saw blip. but too
					short to determine anything.
132826	R3 end.	5000ft.			End of run turning early
					to right. to get clear plume
					again.
					turning left for descent to
					4000ft.
133018		4300ft.			In top of Cu. with change alt.
133125	R4	4000ft.			CO doesn't cal, O3 decrease 28-3 ppb
					NOx increase ~4 ppb.
133357					right in tops of cloud
					2D seeing water drops.

Aircraft Scientist's Log

Flight No B..169..... Date ..13/12/05..... Page 5 of 12

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GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
133520					from 5 ⇒ 4 kft. Seeing marked inversion.
133640					50ft above cloud top.
					edge of plume.
					wind: 7ms⁻¹ / 125°
					014° / 20knts.
133702					CO 140.21
133711					main plume. 2 diff layers one above
133730					point C turning.
133738					1st of it run. (plume)
					then seeing increase in CO
					in large plume, but otherwise
					larger concs. before in main plume
133828		4000ft	341	51.1/0.6W	in cloud tops.
					PCASP 2@3300 ⇒ 2500 counts ~½ μm diam. const.
					AMS not huge amount ~¼μm/m³
134028		4000ft	341	51.2/0.7W	starting tops of W 818.
					looks like just went through
					very top of plume only.
134517			351		at point B.
134907	R4	4000ft		51.6/0.9W	End of run early
					turning + descending to 3000ft.
					CO increasing, O3 decreasing
					due to going into boundary
					layer.
					AMS large increase in sulphate according to heavy in boundary layer.

Aircraft Scientist's Log

Flight No B.149..... Date ..13/12/05..... Page ..6.. of ..12

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GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
135132	RS	3000ft.	201	51.6/0.8	wind 11ms⁻¹/344°
					O3 36.7, CO 122.67
					SO2 2.48
135254					In cloud.
					At bottom of Cy.
135430		3000ft.	159	51.3/0.5W	Seeing fluctuations in O3
					+ CO amounts (100 → 140 ppb)
					winds 11ms⁻¹/342°
135859			159	51.2/0.7W	Going into cloud. 8/8 Cu.
					10miles to Midhurst.
					O3 31.2, CO 128
					wind 9ms⁻¹ 350°
					001°/13knts.
140109				51.0/0.6	at point C. (Midhurst)
					have to continue heading due
					to aircraft
140142					Turning left onto leg.
					Appear to be below
					max 7 ppb NOx
					145 ppb CO
					cloudtops 250 → 450 max
					AMS no real changes
					mainly sulphates + some
140329					
					wind 8ms⁻¹ /351
					002 /22

IL

Aircraft Scientist's Log

Flight No B..149..... Date ..13/12/05..... Page 7 of 12

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GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
140351					due S of Hemel Hempstead
					dust phys. 900 → 1000
140444					CO 159.19 ↑
140522			84	51.0/0.2W	CO 166.6
					aerosol. 900 → 600
					winds 7ms⁻¹ 15°
					008/16 knts.
140638					CO peak: 195 ppb.
					AMS seeing steady increase
					in sulphate (not discrete).
					CO possible emissions from
					London.
140813				51.0/0.0E	CO 167.9 ↓
					O3 28.8 ppb.
140943					point D.
					continuing due E
					aerosol. 500 cc. - London pll.?
					AMS - seeing things generally
					associated with combustion.
					CO 147, O3 33.9 ppb.
141138			88	50.9/0.3	South of Gravesend.
141316				50.9/0.4	turning + descending.
141702	R6	2000ft.	264		Leading back to A.
142634					CO 147.55, O3 19.8,
					SO2 2.98
					plume above.

Aircraft Scientist's Log

Flight No B.149 Date 13/12/05 Page 8 of 12

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GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
142737		2000ft.	337		Clear of plume above then dropping off
					AMS - typical for urban pollution
					cloud phys: peak 150/cc.
					CO 150.8, O3 22.9
					SO2 3.18
					T 0.46, T_D -0.17°C
143230					Having to manoeuvre away from aircraft.
143558	R6 end	2000ft	356	51.5/0.9W	Run end
					Increasing altitude to 3000ft.
143720		3000ft.		51.6/0.9	Climbing to 4000ft.
					wind 9ms⁻¹ 133°
		3820ft.			Top of C.
1439	R7	4000ft.	151		St. Run.
					O3 44.7, CO 112.5
					SO2 1.18
144502.					Increase in CO ~~drop~~ in cloud top prob. due to convection bringing lower level up
14:48:40				51.0/0.6	point C turning right.
14:48:48					in plume. visually only aerosol increased 20→40

Aircraft Scientist's Log

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GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
144963			92	51.0/0.5	NOX + SO2 increase (small)
					Can see more plume
					ahead. Maybe split in 2.
145133					In cloud - increase in 10
					aerosol max. 1200 cc. nom 50→160
145215			91	51.0/0.2	Chem small increase
					~~decrease~~
145300					Come through plume at to
					left.
					In + at of cloud tops.
				51.0/0.0	winds 5ms⁻¹ 355°
					OOT 1/16
145628	R7 end	4000ft		51.0/0.1	End of run, climbing
					to 4500 ft.
					AMS - increase in organics
					unburned hydrocarbons.
					CO also increased + O3 decrease
145822	R8	4500	288	50.9/0.1	Start of run from D to C.
					Can see plume ahead.
					above cloud tops, 5/8 Ci above.
					definately in clear air.
150131			287	50.9/0.1	cloud phys. 50cc ambient
					level.
					CO 109, O3 49.6, SO2 0.78

Aircraft Scientist's Log

Flight No B..149..... Date 13/12/05..... Page 10 of 12

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GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
150332		4500ft.			Harder to see plume.
					8/8 Cu below.
150541		4500ft.		51.0/0.5	At point C (Midhurst)
			331		Heading direct to Cranfield.
					winds 11ms^{-1} 18°
					CO 110, O3 49.6, SO2 0.67
					ambient levels
150957					Hazy, smell in cabin?
					cloud drops 50 → 100 cc aerosol.
15:12:57		4500ft.	0	51.3/0.6	8/8 Cu below.
15B25	R8 end	4500ft.			For air traffic increasing to 6000ft. then will descend
					SAMS increase in organics in plume.
					Typical for organics on soot particles.
151736		6000ft.			descending
		~~4000~~			
151810	R8	4500ft.	357	51.6/0.6	Recommence of R8.
					Trying to sort out permissions
153551			165		Descending in direction of Hemel Hempstead.

Aircraft Scientist's Log

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GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
153634	R9	4000ft.	162	51.9/0.5	Above Cu 818.
	R9end.	4000ft.	166		end of run
		~~3500ft.~~			descending to 3500ft.
	R10st.	3500ft.	166	51.7/0.4	no increase in dem or
154132	R10end	3500ft			a descending. to get below
					clwd.
	R11	3000ft.	267	51.6/0.5	in base clwd.
	R11end.				
154259					large rise in AMS sulphate
					descending to 2.5kft.
164440		2500ft.			Heading towards plume
164338	R12	2500ft.			fire on left. photos taken.
					winds 10ms^{-1} /324°
					343 /22 knts
154552					In plume + base of clwd.
154600					clwd phys. 750 ⇒ 2500 cc.
					10 delayed increase 140ppb.
					for just a second.
					AMS soot (unburned
154815	R13	2000ft.			hydrocarbons)
154818	R13	2000ft.	331		In plume.
					wind 7ms^{-1} /335
					331 /16
					aerosol 4000 ⇒ 4500 counts.
155006					On top of fire

Aircraft Scientist's Log

Flight No B...149... Date 13/12/05..... Page 12 of 12

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GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
		2000ft.			clean peak, 228 CO
155048	~~R2~~				Turning left to go back
155051	R1end	2000ft.			through smoke.
					Cloud phys 4000→5000 cnts.
155204					Fire to left.
		2000ft.	168	51.6/0.5	PCASP ~600 cnts.
					Turning left back to
					source
					wind 10ms⁻¹ 327°
					T 1.2, T_D −1.1S
155347	R4	2000ft.			Entering plume.
					slight turn to go right along plume
					aerosol increase to 5000
					CO to 190ppb. (few seconds delay)
155433					aerosol ~500 cc "maybe int. location.
		2000ft.	322	51.7/0.4	T 1.26, T_D −0.7C.
					winds: S 1334°
					CPI large blobs ~10→50 μm
					PCASP ~10000 plus
					AMS – soot only
					CO ~200ppb.
					NOX ~2 ppb. larger out of plume.
					SO2 ~1.5ppb.
	R1end				Returning to Cranfield.

~16:~~15~~

Land.

CN ~~high~~ max 20000

everything stayed below cloud.

Aircraft Scientist's Log

Edges S1.0/0.6W 124120
S1.1/0.7W 1min46 124306 (15°-20°)

MISSION SCIENTIST 2: STUART NEWMAN

Flight No B.149..... Date 13/12/2005..... Page 1 of 6

GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
115918					TAKE OFF
1209	R1	FL090	165	0.9W S1.7N	Smoke plume to port
					Wind 9ms-1 / 11deg
121430	"	FL090	164	S1.4N 0.8W	Wind 12ms-1 / 29deg
					Passed plume source to port
					O3 50ppb CO 112ppb
					CNC 350 / cm-3
1220	"	"	152	S1.1N 0.6W	Wind 12ms-1 / 34 deg
1224	"	FL090	90	S1N 0.3W	Wind 13ms-1 / 46 deg
					CNC 571 / O3 49 / CO 115
					Heading eastwards south of source
1228	end R1	FL090			
	P1	to FL060			
123238	R2	6000'	271	S1.0N 0.1E	Wind 14ms-1 / 24°
					CNC 568 / O3 52 / CO 120
1236	"	"	282	S1.0N 0.1W	Wind 13ms-1 / 19°
					CNC 548 / O3 52 / CO 120
1241	"	6000'	339	S1.1N 0.6W	CNC 582 / O3 51 / CO 120
					Winds 13ms-1 / 15°
124452	R2	Inter.			Held in orbit
124905	"	Recomm.	340	S1.2 0.7	
1301	"		349	S1.8N 1.0W	Wind 10ms-1 / 357°
130402	end R2				CNC 617 / O3 50 / CO 121
130730	R3	5000'	162	S1.9N 1.0W	CNC 582 / O3 49 / CO [cal]
					Winds 12ms-1 / 349

Cat. U Essex from NATS

Aircraft Scientist's Log

Flight No B.149..... Date 13/12/05.....

GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
131330	R3	5000'	167	51.6N 0.9W	Winds 13ms-1 / 353°
					CNC 332 / O3 48 / CO 108
1317	"	"	155	51.4N 0.8W	Turn towards Midhurst
					Winds 11ms-1 / 354°
					CNC 341 / O3 50 / CO 108
131830	"	"	154	51.3N 0.8W	Plume visible to port (east)
					but source may be extinguished
132130					Approaching edge of plume
132230				51.0N 0.6W	Edge of plume, below us
132311	"	"			Turning, in middle of it
					Wind 12ms-1 / 22°
					PCASP ↑ 5000 from 100
132430	"	5000'	090	51.0N 0.4W	Seem to have passed over;
					no great change in O_3, CO
					CNC up to ~4000
132826	end R3	5000'		51.0N 0.1W	Turning, in cloud at 4000'
133125	R4	4000'	281	50.9N 0.1W	CNC 4000 / O_3 34 / CO [cal]
					Winds 5ms-1 / 29°
					↑ NO_x by 4ppb
1334			298	50.9N 0.3W	In cloud tops
133630					In edge of pollution, soft above cloud tops
133714					Into main plume 0.5μm sizes
133739					Out of it
133915	"	4000'	338	51.1N 0.6W	CO ↓ from 200 to 120, O_3 40ppb
					Winds 6ms-1 / 11°

Aircraft Scientist's Log

Flight No **B**149 Date 13/12/05 Page 3 of 6

GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
1344	R4	4000'	339	51.3N 0.8W	Winds 5/6ms^{-1} / 358°
					CNC baseline ~350/cc
					CO 108 ppb, O_3 44 ppb
1350					Turn onto flight leg at 3000'
13 4907	end R4				↑ Sulphate in boundary layer
135132	R5	3000'	159	51.4N 0.8W	Winds 10ms^{-1}/342°
					CNC 5000 (cloud)
					CO 136 / O_3 25 ppb
1359	"	"	158	51.1N 0.7W	Nearing plume CNC 7000
					CO 144 / O_3 30 ppb
1400-01				51.0N 0.6W	Appear to be sitting underneath.
					Max 7ppb NOx 145 ppb CO
1404					CO 150+ ppbv
					900-1000 Cloud Phys. aerosol
1407	R5	3000'	084	51.0N 0.0E	Winds 6 ms^{-1} / 356°
					O_3 21/CO 201/CNC 8000
1410	"	"	088	51.0 0.2E	Winds 7ms^{-1} / 4deg
					CNC 5170 / O_3 34 / CO 142
					≤1 μg/m^3 organics AMS
					PCASP has shown 500-600/cc, occasionally 1000/cc, but
141244	end R5				not higher even within plume
141702	R6	2000'	280	51.0N 0.1W	(1870ft) CNC ~10,000 CO 177, O_3 27 ppb
1423		"		51.0N 0.3W	PSAP abs coeff ↑, [illegible]
					PCASP ↑1500 or 50 CO ~150, O_3 ~29
					Winds 7.5ms^{-1} / 1°
					Peak in CNC ~15000/cm^3

Aircraft Scientist's Log

Flight No **B**.149..... Date 13/12/05..... Page 4.. of 6...

GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
1426			336	51.0N 0.6W	Wind 6ms^{-1} / 351°
					CO 159 / O_3 20 / CNC 8000
143552	end R6	2000'		51.6N 0.9W	Climb to 4000'
	R7	4000'	142	51.5 1.0W	CNC 2850, skirting tops of cloud
					CO down to 115, O_3 ~43 ppb
144440	"	4000'	156	51.2N 0.7W	Winds 11ms^{-1} / 337°
					CO 109 / O_3 45 / CNC 1150 Still close to cloud tops
144730			149	51.1N 0.6W	Edge of plume below
1451			090	51.0N 0.3W	CO↑ ~180 O_3 ↓ ~20 ppb
					PCASP showing increase too
145628	end R7	4000'			
145822	R8	4500'	288	50.9N 0.0E	Winds 11ms^{-1} / 18°
					CNC 398 / CO down 110 / O_3 50 ppb
					50/cc particle conc.
					Heading back closer to Kemel Hempstead
1507			005	51.1N 0.5W	CNC 435 / O_3 50 / CO 112 ppbv
1510			001	51.2N 0.6W	Winds 10ms^{-1} / 3°
					CNC 667/cm^3 / O_3 51 / CO 114 ppbv
					PCASP 30-50↑100
					Above cloud tops
1513	R8	"	000	51.4N 0.6W	Winds 10ms^{-1} / 3°
151345					CNC 650 / O_3 50 / CO 116
1517		~5500'	000	51.6N 0.6W	
151830	R9	4500	359	51.7N 0.6W	CNC 674 / O_3 50 / CO 118
1521	"	"	357	51.8N 0.6W	Winds 11ms^{-1} / 350°
					CNC 770 / O_3 50 / CO 118 ppbv

Aircraft Scientist's Log

Flight No **B**...149..... Date ..13/12/05..... Page ...5... of ...6..

GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
1524	R9	4500'	606	51.9N 0.5W	In holding pattern near Cranfield
1528		"	030	52.2N 0.4W	North of smoke source awaiting
					instructions re: permission to
					fly closer to source
					CO = 114 O_3 = 50 ppb CNC = 860/cm^3
1535		4500'	213	52.1N 0.5W	Winds 13ms^{-1} / 339°
153634	R10	4000'	163	52.0 0.5W	Winds 14ms^{-1} / 332°
					CNC 730 / CO 113 / O_3 50 ppb
	end R10.				
		3500'			Run over top of source
153936	R11	"	166	51.7N 0.4W	Mile to left is source
					CO ~ 124 O_3 ~39 CNC 1560 (but in cloud)
154053		3500'			Turn to right
					Wind 14ms^{-1} / 336°
154135	↓	3000'			
	Start	3000'	266	51.6N 0.5W	Wind 9 ms^{-1} / 347°
154300					Right turn towards site before drop to 2500'
				51.6N 0.6W	Just in bottom of cloud
154448	on run 12	2500'	099	51.7N 0.5W	Heading directly for plume
					Winds 9 ms^{-1} / 329°
154554					In plume now
					Big ↑ aerosol 1000-2500 PCASP
154640		end 2000'			CO only ~ 140 ppbV (response time?)
					AMS "soot"
154815	R13	2000'	332	51.6N 0.3W	CO ↑ 150+, approaching line

Aircraft Scientist's Log

Flight No B.149..... Date 13/12/05..... Page 6 of 6....

GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
154950	R13	2000'	323	51.7N 0.4W	On top of line 155010
					Winds 8 ms-1 / 335°
155051	end R13				Peak 228 CO, 4000-5000 PCASP
155347	R14	2000'			Reciprocal 2000'
					Winds 12 ms-1 / 325°
155355					Entering Start of plume
					↑800-3000, 3000 PCASP, even 8500
					↑CO, 190ppb even 10,000+
155448			325	51.7N 0.4W	In Smoke
					CNC 20,000 big signal
					Several hundred ppbv CO Winds 7 ms-1 330°
					NO_x, SO_2 signals
					2ppbv
160013					LAND

CLOUD PHYSICS LOG Flight B

Date: **Operator:** **DRS time:** **DAU1 time:** **DAU2 time:** **DAU3 time:** **AUX1 time:** **AUX2 time:**

G.M.T	PCASP		FFSSP	SID1	SID2	2D2-C		2D2-P		CIP25			CIP100			Habit	Remarks
	Conc/cc	Mean R	Block TX	Count	Count	Conc/L	Max size	Conc/m3	Max size	Conc m3	Max size	LWC	Conc m3	Max size	LWC		
120839	37	0.09	1	0													Start run @090
1211	50	0.08	1														
1214	40	0.08	1														
1219	40	0.06	1														
1223	40	0.06	1														
1228	35	0.07	1														
122925																	End run 1
123240	100	0.08	1														Start run 2
1234	100	0.09	1														
1236	100	0.09	1														
1239	100	0.09	1														
1241	100	0.09	1														
1244	120	0.09	1														
1248	120	0.09	1														
1250	130	0.08	1														
1253	100	0.09	1														
1256	100	0.08	1														
1259	120	0.09	1														
1302	120	0.09	1														
1304	100	0.09	1														
130402																	End run 2
130729	100	0.09															Start run 3
1310	30	0.08	1														
1314	15	0.08	1														
1317	30	0.08	1														
1320	30	0.08	1														
1323	20	0.07	1														
1324	3000																
1326	40	0.07															
1328	60	0.08	1														
																	End run 3
																	Start run 4

CLOUD PHYSICS LOG Flight B

Date: **Operator:** **DRS time:** **DAU1 time:** **DAU2 time:** **DAU3 time:** **AUX1 time:** **AUX2 time:**

G.M.T	PCASP		FFSSP	SID1	SID2	2D2-C		2D2-P		CIP25			CIP100			Habit	Remarks
	Conc/cc	Mean R	Block TX	Count	Count	Conc/L	Max size	Conc/m3	Max size	Conc m3	Max size	LWC	Conc m3	Max size	LWC		
133125	300	0.2	409	5000		10	50										Startbrun 4
1334	400	0.2	1010	7000		10	25										
1337	2000	0.09	1327														
1340	70	0.09	1423	10													
1342	30	0.08	1430														
1345	30	0.08	1430														
1348	25	0.08	1430														
134907																	End run 4
	350	0.09	1540	100													Start run 5
1354	175	0.13	1593	1000													
1357	150	0.1	1761	80													
1359	200	0.09	1762	80													
1400	350	0.09	1762	80													
1402	450	0.09															
1403	950	0.09	1762	80													
1405	700	0.09	1762	80													
1407	750	0.09	1762	80													
1410	550	0.09	1762	80													
1413	600	0.08	1762	80													
141702																	Start run 6
1418	600	0.09	1762	80													
1422	1200	0.1	1762	80													
1425	500	0.09	1762	80													
1427	500	0.09	1762	80													
1429	500	0.09	1762	80													
1433	350	0.09	1762	80													
1436																	
144																	Start run 7 @ 040
1441	100	0.08	1881														
1443	50	0.08	1881														
1445	50	0.08	1968														
1448	30	0.08	1991														
1450	40	0.15	2014														
1452	1000	0.12	2165														
1455	350	0.09	2355														
145726																	End run 7
145822	30	0.08	2520														Start run 8
1501	40	0.08	2520														
1503	40	0.08	2520														
1505	80	0.09	2520														
1507	80	0.08	2520														
1510	80	0.06	2520														
1512	100	0.09	2520														
151325	130	0.09	2520														End run 8
1519	130	0.08															Recommence 8
1521	150	0.07	2520														

CLOUD PHYSICS LOG Flight B

Date: **Operator:** **DRS time:** **DAU1 time:** **DAU2 time:** **DAU3 time:** **AUX1 time:** **AUX2 time:**

G.M.T	PCASP		FFSSP	SID1	SID2	2D2-C		2D2-P		CIP25			CIP100			Habit	Remarks
	Conc/cc	Mean R	Block TX	Count	Count	Conc/L	Max size	Conc/m3	Max size	Conc m3	Max size	LWC	Conc m3	Max size	LWC		
1523	150	0.08	2520														
1530	90	0.08	2520														
1532	136	0.08	2520														
1533	130	0.08	2520														
153634	40	0.07	2520														Start run 9
1543	500	0.09	3042														Start run 10
1544	750		0.08														
1545	800	0.08															
1546	2500	0.08															
1549	4500	0.09															
1551	700																
1552	700	0.08															
1554	8500	0.09															

CLOUD PHYSICS PROCESSING LOG

Flight number: B149
Date: 13/12/05

A) FFSSP PROCESSING		
Processing Stage	Completed	Comments
1) Transfer *.txt files from DVD to PC Bnnn_FFSSP_hh.txt for each hour of data Bnnn_FFSSP_HVMS.txt	Y	
2) FTP the files (ascii) from the PC to the directory PMSDATA: on FLOODS	Y	
3) RUN MRFB:[PMS.FAST_FSSP]FSSP_EXTRACT_TAS a) Flight number: Bnnn b) Path name: MFDDATA:Bnnn_MFDX c) Output directory: PMSDATA: d) Start time: 0 if unknown e) End time: 240000 if unknown	 Y	
4) RUN MRFB:[PMS.FAST_FSSP]FFSSP_PROCESS_TXT a) Flight number: Bnnn b) Directory: PMSDATA: c) TAS in processing: Y d) Vel threshold (clicks) 0 e) Calibration file: Use the most recent calibration file. Format FFSSP_CALddmmyyyy.txt Calibration files to be stored in MRFB:[PMS.FAST_FSSP] f) Adjust FFSSP time Y/N g) If Y, enter value to add to data time (seconds)	 Y	Note the calibration file used FFSSP_CAL_19112005.TXT Yes only if gross errors occur in FFSSP time eg; ~ 1hour -10800 NOTE THAT FFSSP CLOCK WAS OUT BY 3 HOURS
5) In PVWAVE a) enter: !path=!path+',mrfb:[pms.proc]' Note that the comma before "mrfb" is important! b) write_procffssp_to_m5,'pmsdata:Bnnn_procffssp.dat', 'mfddata:Bnnn_mfdX','pmsdata:Bnnn_m5procffssp',/auto 1st argument is output file from 5) 2nd argument is the MFD 3rd argument is the new FFSSP data file in M5 format		 Note the correction applied to FFSSP time by /auto -4
c) exit	Y	
6) MODIFY a) Modifying datasets: pmsdata:Bnnn_m5procffssp b) Datset: mfddata:Bnnn_mfdX c) New dataset: Enter updated MFD name d) Parameter description file: leave blank to use default		
7) CHECKS:		
i) FFSSP and JW/Nevzorov LWC – are they correctly synchronized in time?	Y	
ii) If not, may be necessary to repeat 5b) using addt=x keyword. This adds x sec to FFSSP time.		

CLOUD PHYSICS PROCESSING LOG

Flight number: B149
Date: 13/12/05

B) 2D PROCESSING		
Processing Stage	Completed	Comments
1) Transfer Bnnn.dat file from CD/DVD to PC	Y	
2) Zip up file on PC (Bnnn.zip)	Y	
3) FTP the zipped file (binary) from the PC to the directory SEADAS_DATA:[SEADAS_DATA] on FLOODS	Y	
4) Log on to FLOODS		
5) unzip SEADAS_DATA:[SEADAS_DATA]Bnnn.zip	Y	
6) In PVWAVE i) !PATH=!PATH+',MRFB:[PMS.PROC]' ii) CONVERT_SEADAS_FILE a) Input file: SEADAS_DATA:[SEADAS_DATA]Bnnn.dat b) Output file: SEADAS_DATA:[SEADAS_DATA] Bnnn_seadas.dat iii) exit	Y	Note the number of bad block reads and/or final numbers of blocks read & written Bad reads = 0
7) run MRFB:[PMS.SEADAS]READM200_FILE a) Default directory: PMSDATA: b) Flight number: Bnnn c) Disk file name: SEADAS_DATA:[SEADAS_DATA] Bnnn_seadas.dat d) Comment string: e) Start time: 0 if unknown f) End time: 240000 if unknown g) Read 2DC: Y h) Read 2DP: Y i) Secondary data Y j) FSP-SYNC: Y k) cmd.str: Y l) Auto time correction: N m) Full length secondary: N	Y	110000 170000
8) 2D image display and printing Quick look at image blocks if required In PVWAVE i) !PATH=!PATH+',MRFB:[PMS.PROC]' i) WAVE> IMAGEDISPLAY a) 2D directory name: PMSDATA: b) Flight number: Bnnn c) IWC plot: N d) Select probe: (1) 2DC (2) 2DP e) Start time: 0 if unknown f) End time: 240000 if unknown g) Time interval (sec): 0 for every image block nominal 5 sec		This section is optional Features to look for: 1) Noise on 2D-P – does it affect non-edge diodes (with potential to create spurious particle counts)? 2) Can you identify a dominant particle habit for the whole flight (eg. drops or crystals) 3)
Preparation of imagery for Core data product		

iii) WAVE> auto_image a) 2D directory name: PMSDATA: b) Flight number: Bnnn c) Enter date: YYYYMMDD d) Enter start time 0 if unknown e) Enter end time 240000 if unknown f) Enter time interval (sec) between successive imaged blocks 10	Y	Done for 1 and 10 sec
iv) exit PVWAVE Creates files	PMSDATA:	FAAM_YYYYMMDD_R0_Bnnn_2Dx-IMAGES.PS
ftp *.PS files from PMSDATA: to PC	Y	
Load each into Ghostview or other pdf-converter	Y	
Output as pdf file (70 dpi resolution) and append name prefix of CORE-CLOUD-PHY_ to converted files	Y	In O:\CloudPhysics Core data
9) run MRFB:[PMS.SPEC2D.AUTO]PROCESS2D_AUTO		
a) Flight number: Bnnn b) Directory: PMSDATA: c) File generation: Hit enter d) Time correction: Time offset of the 2D data		
e) TAS: Y f) MFD directory: MFDDATA:Bnnn_MFDX g) Probe number: (1) 2DC (2) 2DP (0) Both 0 unless either probe known to be faulty h) Start time: 0 if unknown i) End time: 240000 if unknown j) Nominal averaging: 0.2 seconds for conversion to M5 k) Particle type: 8 if known to be in ice cloud 11 if known to be in water cloud 8 if known to be in mixed-phase 8 if unknown l) Coefficient choice: 2 m) Output root filename: PMSDATA:Bnnn_PROC2D	Y	120000 161000 Note the particle type 8
10) In PVWAVE		
i) enter: !PATH=!PATH+',MRFB:[PMS.PROC]' Note that the comma before "mrfb" is important! ii) WRITE_PROC2D_TO_M5, 'PMSDATA:BNNN_PROC2D.DAT', 'PMSDATA:BNNN_M5PROC2D' iii) exit	Y	
11) MODIFY		
a) Modifying datasets: pmsdata:Bnnn_m5proc2D b) Datset: mfddata:Bnnn_mfdX c) New dataset: Enter modified MFD name d) Parameter description file: leave blank to use default	Y	
12) CHECKS:		
i) Is 2DC/2DP IWC of comparable magnitude and well-correlated with Nevzorov TWC?		

CLOUD PHYSICS PROCESSING LOG

Flight number: B149
Date: 13/12/05

C) PCASP PROCESSING		
Processing Stage	Completed	Comments
1) Complete stage 7) in 2D processing Ensures Bnnn_FSP.DAT containing raw PCASP data is written to directory PMSDATA:	Y	
2) run MRFB:[PMS.PCASP]PROCPCASP_NEW a) Flight number: Bnnn b) File name: PMSDATA:Bnnn_FSP.DAT c) Root output name: PMSDATA:Bnnn_PROCPCASP Produces PMSDATA:Bnnn_PROCPCASP.DAT (binary) PMSDATA:Bnnn_PROCPCASP.OUT (ascii) d) Minimum size channel: Default = 1 If smallest size channel are known to be noisy the value of the highest noise free channel to be entered here e) Calibration volume flow rate: Use the most recent value. Calibration files to be stored in **????** Entering zero gives default value = 1.0 cm3/sec f) Time correction: Same value as used in 2D processing stage 9 d) g) Start time: 0 if unknown h) End time: 240000 if unknown	Y	Note the min size channel Note the volume flow rate 1
3) In PVWAVE i) enter: !PATH=!PATH+',MRFB:[PMS.PROC]' Note that the comma before "mrfb" is important! ii) write_procpcasp_to_m5,'pmsdata:Bnnn_procpcasp.dat' ,'pmsdata:Bnnn_m5procpcasp' iii) exit	Y	
4) MODIFY a) Modifying datasets: pmsdata:Bnnn_m5procpcasp b) Datset: mfddata:Bnnn_mfdX c) New dataset: Enter modified MFD name d) Parameter description file: leave blank to use default	Y	MFDB

Filter Sampling Log

Flight No: B149 **Date: 13/12/2005** **Operator: SWH**

Run No	Disk No 1	Disk No 2	Disk No 3	Top/ Bottom	Time On	Time Off	Flight Run	Accum Vol [l]	Comments
1	38	122	57	Bottom	124641	132837		5381	
2	1	74		Bottom	133630	133847		482	
2				Bottom	141728	143605		2751	Restart
3	7	160	109	Bottom	144728	145732		2625	
4	2	67		Bottom	145714	154000		3384	
4				Bottom	154440	155620		4542	Restart

P.S.A.P. Log

Flight No. ..B149..... Date ..13/12/05..... PAGE 1

GMT	Filter Trans.	Flow Rate	B_a x 10^{-6}	Ph_det levels		Run	Remarks
Set to DRS time ✓	New filter Tr = 1.000	Set to ~~2.0~~ lpm	24.7	21	46	(30s) ? Ave =30 s	←Preflight ✓
122157	1.000	2.95	0.0E-6	24	44	30s	changed
123515	1006	~~2~~.68	.4E-6	24	45		
124059	1.000	2.97	.0E-6	24	45		reset TR.
124735	.999	2.97	2.0E-6	24	45		
130746	.998	2.98	.0E-6	24	45		
131540	.998	2.95	19.1E-6	23	48		
132837							Pump off
133630	.935	3.09	142.2E-6	20	45		Pump ON
140755	.901	3.06	14.8E-6	19	45		
142011	.782	~~2~~.99	11.5E-6	18	45		
143414	.738	3.01	5.8E-6	17	45		
143707							Pump off
144839	~~.736~~	2.77	1.2E-7	17	45		Pump on
151920	.713	~~2.66~~ 2.54	2.4E-6	17	45		

SWS FLIGHT LOG SHEET

Flight # B149 | Date 13/12/05 | Operator(s) DRK | log page 1 of 6

Time	Run id	Alt/FL	Mirr Pos	Int Times Vis	Int Times NIR	Remarks
115544						SET TIME FROM HORACE)
115741						SET JACK VIEW
115805	PRE	T/O	90° AFT	500	500	Start Measurement (Test)
115826						Stop
115913						T/O CONFIRMED
120016						Start Dark View
120040	TRANSIT	1.4kft	90° A	750	1000	Start Measurement
120154						Start Dark View [Sample period 1 sec]
120218	"	52kft	174° (A) ↓	750	1000	Start Measurement [Temp +13°C]
120839	R1.	FL090	"	750	1000	Start R1. (A>>) [+14°C] All Peltiers on.
121414				←		Measure Dark View (x2).
121437						Restart Measurement. (well above smoke at this level)
121650		START	CAMERA TAKE #1			0001. (looking downwards) (+13°C)
121920						Over field (q extensive) of Sc below.
122033	R1.	FL090	174° (A) ↓	1000	1000	Dark View Col" Restart Measurement [Single Period 1.00 sec]
122142						Point B. now (o/h). [Temp +13°C]
1224		→ V. bright spectra from Sc field underneath. (clipping on vis especially)				
122537				←		Start Dark Col
122603	R1	FL090	174° ↓ (A)	1000	1000	Start Measurement
1227-28	END		←	[Manual]		Adjust SWS < to point 160°, then 140° AFT EVEN BRIGHTER ON VIS THAN NADIR]
122925	R1	FL090	174° ↓ (A)	1000 ms	1000 ms	END RUN 1 [Sample Period 1 sec] [Temp +13°C]

SWS FLIGHT LOG SHEET

Flight # B 145 | Date 13/12/05 | Operator(s) DRK | log page 2 of 6

Time	Run id	Alt/FL	Mirr Pos	Int Times Vis	Int Times NIR	Remarks
123157				←		Start Dark Current View } clipping
123207				←		Start Measurement. }
123240	Run 2	6000' (5.3kft)	174° A (↓)	1000	1000	Start R2. [Sample period 1.00sec]
						[SWS Temp +12°C]
						Wind 010/27kt – FLIGHT DECK
						HALSKE 019/14 m/sec⁻¹
						Start Dark Current View (x2) } Adjusting
123719	Run 2	6000' (5.3kft)	174° A (↓)	250	750	Start Measurement } Integ^n times
124045		→				In Turn, coming over plume as roll out
						No 'plume' evidence on C. Physics or Core Chem.
124315		→				Coming over Plume edge
124410		→				Start Dark Measurement. – [Temp +12°C]
124422						Start Measurement
124452		→				Interrupt R2 for ↑ circuit to avoid other air traffic
124905	Run 2	6000'	174° A (↓)	250	750	Recommence R2 at 6000' [Sample period 1.0 sec ; Temp +12°C]
125235				←		Start Dark View (Mainly New Clear or cloud below)
125245	"	"	"	500	750	Start Measurement.
125320						o/h Woodley, heading for Daventry
1255						← [Temp +11°C Peltiers IR2 off]
1301						← Current Temp +12.
130200						→ Dark Measurement
130213	Run 2	6000'	174° (A) (↓)	250	750	Start Measurement (Some Sc layer T/S below – otherwise clear)
130402	END R2	6000'	"	"	"	End R2 (Turning L) [T/S Ci above]
						Descending for 5000'
130705				←		Start Dark Current View
130718						Start Measurement [Temp +14 ALL Peltiers on]
130729	START R3	5000'	174 (A)	250	750	Start R3 A → D
130910			(↓)	RESET TIME FROM HALSKE		

SWS FLIGHT LOG SHEET

Flight # B 145 | Date 13/12/05 | Operator(s) JCK | log page 3 of 6

Time	Run id	Alt/FL	Mirr Pos	Int Times Vis	Int Times NIR	Remarks
1311 →		5000' (1040mb) (+3kft 1013mb)		250	750	What 35° / 12 sec Heatce on this run at 5000'
						Dark Current views (x2) Generally Now clear of clouds below —
131736	R3	5000'	174°(A) ↓	750	1000	Start Measurement RESET INTEG^N TIMES [Sample Period 1sec] (Temp +13°C)
132255				←		Dark Current views
132308	R3	5000'	"	250	750	Measurement start.
1323 →						o/h Midhurst, turning for Mayfield (Ptc)
132826	End R3	5000	174°(A) ↓	25	750	End R3 & Turning, descend to 4000' [Sample 1 sec] for Run 4.
133100		Change to	↑ view now manually			
133125	Start R4	4000'				Start R4 [SWS Temp +13°C]
133154						Dark current view
133203	R4	4000'	006°(F) ↑	250	750	Start Measurement [Sample Period 1sec]
133400				→		In cloud tops along this run
133620		→				Out of cloud tops now. (~50' Sc tops below us)
133710		→				Into main plume now (1 layer above us 1 just below near cloud top)
133740		→				Out of plume.
133833		→				Into cloud tops again now. [Temp ~1/2 plume]
134019						Dark current view (mainly above cloud).
134034	R4	4000'	006°(F) ↑	400	1000	Start Measurement
134430						Some Sc just below; 6-7/8 thin Ci above.
134518						At point B, B→A. [+13°C]
134616		→	Change view to			↓ rest of run (Start Dark Current)
134628						Start Measurement
134915	End R4	4000'	174°(A)	400	1000	End R4. Descend to 3000'; Turn to ↑ view
135046						Start Dark View
135105			006°(F)	250	1000	Start Measurement.
135133	START R5	3000'	006°(F)	250	1000	START R5.

SWS FLIGHT LOG SHEET

Flight # B149 | Date 13/12/05 | Operator(s) DRK | log page 4 of 6

Time	Run id	Alt/FL	Mirr Pos	Int Times Vis	Int Times NIR	Remarks
~ 135430						o/h Woodley
135738				→		o/h Farnborough. [redacted] runway.
135755	Run 5	3000'	006°(F)	250	1000	Generally in & under clouds.
						On this run [SWS Temp +12°C]
[redacted]						
140105			←			Under plume now.
140158						Turning at Pt C for Pt D
						Wind 355/8 m/sec.
140327				←		Start Dark View Cal (HEATED)
140339	Run 5	3000'	006°(F)	500	1000	Start Measurement
			↑	(Sample Period 1.00 sec)		CO ↑ now. Aerosols ↑ 900/cc.
						[Temp +12°C]
140627			→			Chemistry generally 'high' values.
140943			→			At Pt D, but continuing E beyond pt D to see if chemistry/aerosols "drop off". Aerosols 600/cc for last ~5-8 mins.
141249	End R5	3000'	006°(F)	500	1000	End R5, turn ⇐ return 3000'
			↑			
141345						Dark View Cal [SWS Temp +12°C]
141357		"	"	"	"	Start Measurement
~ 141540			←			Now can descent to 2000' for leg
141702	Start R6	2000'	006°(F)	500	1000	Start R6.
		(1.3Kft 913mb)	↑	(Sample Period 1.00sec)		
~ 142230			←			Aerosols ~900 ↑ 1500/cc now
						[Temp +11°C, Peltier 1127 current now off]
142650						Dark Cal
142701	R6	"	"	"	"	Start Measurement
143100			←			Under Sc now (fairly continuous).
1435						Running into cloud
143559	End R6	2000'	006°(F)	500	1000	End R6 climb ↑ 4000' soon.
143617			↑			Dark view (al)
143628						Start Measurement

.1530 LAND.

SWS FLIGHT LOG SHEET

Flight # B149 | Date 13/12/05 | Operator(s) JRK | log page 5 of 6

Time	Run id	Alt/FL	Mirr Pos	Int Times Vis	Int Times NIR	Remarks
143915						Manoeuvring (just above Sc cloud here).
14395	START Run 7	4500'	006° (F)	500	1000	Start Run 7
144130		Change from ↑ to ↓ view as were above Sc (just). (& were looking ↑ on previous 4500' run<4)				
144243						Dark Cal
144257	Run 7	4500'	174° (A) ↓	750	1000	Start Measurement
144425			→	(Sample Period 1.00sec)		Into cloud (for ~ 30-40 sec) [Temp +14°C ALL PROBES ON]
144842						Wind 340°/7m/sec (HEADING)
145110	2	minutes of interesting Chemistry	→			Midwest, turning C→D. Into cloud. CO ↑ eO3 ↓ (excellent anticorrel^n)
145315						
145517						Start Dark Cal (Current View)
145528						Start Measurement
145628	End R7	4500'	174° (A) ↓	750	1000	End Run 7. Climb 4500' return to Midwest D→C, 4500' then go Midwest → Cranfield (Sample Period 1.00 sec)
145827	Start R8	4500'	174° (A) ↓	750	1000	Start Run 8 D→C (Above Sc cloud layer)
150447			174°			Dark Current View [Temp +14°C]
150501	Run 8	4500'	↓ (A)	1000	1000	Measurement restarted.
150600			→	(Sample Period 1sec)		Midwest beacon, now turning & will transit Midwest → Cranfield passing Hemel Hempstead to Stbd.
151325						End R8. & Climb.
151408			174° (A)	1000	1000	Start Current View (Dark)
151420	—		↓			Start Measurement
151620		→	SWS Camera OFF (2h 56m 41sec — not another Tyx ? Leg 4)			
151718			Tyx			Descending ↓ back to 4500'
151814	Restart R8	4500'	174° (A) ↓ *	1000	1000	Restart R8
152400		→	Recover Airborne CAMERA TAPE (May prolong flight by up to another 1 hour, near to H. Hempstead)			

1451 – 1456

Increased CO mixing ratio

Increased O3 mixing ratio]

SWS FLIGHT LOG SHEET

Flight # B 479 | Date 13/12/05 | Operator(s) DGK | log page 6 of 6

Time	Run id	Alt/FL	Mirr Pos	Int Times Vis	Int Times NIR	Remarks
153450	—		174° (A) ↓	1000	1000	Manoeuvring, can go back over plume. Discussing best heights for runs.
1536						Descending ↓ 4000'. SWS Temp [+13C]
153633	Start 9	4000' (3.4kft indicated)	"	"	"	Start Run 9
153728	"	"	174° (A)	1000	1000	Start Dark Current View
153750	"	"	↓	"	"	Start Measurement
153907						End Run, descend to 3500'.
153922						Into cloud
153930	Start 10	3500'	"	"	"	Start Run (In cloud legs).
154135	End " Start 11					Descend to 3000'
~ 154250		3000'				Change ↓ to ↑ View, turn & descend to 2500'
154241				←		Start Dark View
154253						Start Measurement
154348	R 12	2500'	006° (A) ↑	1000	1000	Start Run 12 Wind 340/22-A/C 327/10 - HEADING
154557			→			Into plume now.
154640	R 12	2500'	"	"	"	End Run 12 Descend to 2000' for another run thro' plume.
15	Start			←		Dark Cal / RESTART MEASUREMENT MODE
154825	R 13	2000'	"	"	"	[SWS Temp +13°C]
155018			→			O/h plume.
155048	R 13	2000'	"	"	"	
						Final run coming up (2000')
						Change view ↑ + ↓ (to see fire/smoke?)
155244				→		Dark View Cal
155255				→		Start Measurement
155547	Start 14	2000	174° (A) ↓	"	"	(8500/cc PCASP Aerosol)
(no 1555 ⇒) View	00:29:30 → 00:31		on SWS CAMERA Tape looking ↓			(Sand Fires/Smoke)
155645						Final Dark Cal
155659			174° (A) ↓	"	"	Final Measurement mode
160114	SWS OFF					RTB.
[OFF 155920 (35 m 20 sec) TAPE II] 161013						LAND CRANFIELD.
115913						
4 11 00						

Flight Manager's Instrument Status Log

Flight No. **B** 149 Date: 13th December 2005

Instrument	Operated	Instrument	Operated
Navigation		**Cloud Physics**	
INU	**Y**	**Probes**	
XR5M GPS	**Y**	FFSSP	**Y**
Cruciform GPS	**N**	PCASP	**Y**
Satcom C	**Y**	2D-P	**Y**
Satcom H	**Y**	2D-C	Y
Thermometers		Cloudscope	**N**
De-Iced Temp	**Y**	SID 1	**Y**
Non De-Iced	**Y**	SID 2	**N**
Heimann	**Y**	HVPS	**N**
Hygrometers		CIP25	**N**
G. Eastern	**Y**	CIP100	**Y**
J. Williams	**Y**		
Nevzorov	**Y**		
TWC	**Y**		
FWVS	**N**	**Racks:**	
Radiometers		INC	**N**
Upper Clear	**Y**	CCN / CPC	**Y**
" Red	**Y**	CVI	**N**
" Silicon	**Y**		
" JO1D	**N**	**Aerosol**	
Lower Clear	Y	PSAP	**Y**
" Red	**Y**	Nephelometer	**N**
" Silicon	**Y**	Filters	**Y**
" JO1D	**N**	AMS	**Y**
Large Radiometers			
TAFTS	**N**		
MARSS	**N**		
DEIMOS	**N**	**Others:**	
ARIES	**n**	NIR TDLAS	N
SWS	Y	2BT O3	N
Chemistry		VACC	N
Ozone	Y	PEROXIDE	N
SO2	Y	Formaldehyde	N
NOX	Y	ADA	Y
CO	Y	CPI	Y
ORAC	N	NOxy	N
PAN	N	PTRMS	N
PERCA	N	Bag Sampling	N
WAS	N	Tube Sampling	N

Faults / Incidents Log

Flight No. B149
Date: 13th December 2005

Instruments
Aircraft

None!

Satcom H Calls

MISSING LOG SHEETS:

The following log sheets are not available for flight B149:

Log	Reason
Brief	Basic way Point version only
Core Chemistry	pre flight only, unmanned operation on auto calibrate so no In Flight log
CPI	Log only of interest to instrument operator so no copy left with FAAM
CCN	No operator listed so no log though Flight Manager's Instrument Status shows instrument as being switched on.

Document control

Revision	Date	Author	Comments
r0	3 Apr 2006	Doug Anderson	Initial version missing Cloud Physics flight log in addition to above
r1	6 Apr 2006	Doug Anderson	Cloud Physics log added
r2	12 Feb 2007	Doug Anderson	PSAP log added

VIDEO RECORDINGS:

3 x Forward Facing Cameras
4 x Down/Rearward Facing Cameras

Digital8 video recordings from this flight reside with :

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